

WHAT IS CLAIMED IS:

1. An inspection tool for determining the condition of a joint formed between a first and a second object, the inspection tool comprising:

5 an arm disposed proximate a surface of the first object, wherein the surface overlies the joint;

a motion-imparting component for scanning the arm along the surface;

10 a sensor supported by the arm for inspecting the joint, wherein the joint is subdivided into a plurality of zones, and wherein an inspection signal is generated by the sensor for each of the plurality of zones; and

15 a processor responsive to the inspection signal from the plurality of zones for determining a condition of the joint.

2. The inspection tool of claim 1 further comprising a securing component for

20 removably attaching the tool proximate the joint.

3. The inspection tool of claim 2 wherein the securing component further comprises a clamp for removably attaching the tool to one of the first or the second objects.

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4. The inspection tool of claim 1 wherein longitudinal and transversal directions are defined on the surface, and wherein the motion imparting component scans the arm along the surface in the longitudinal and the transversal directions.

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5. The inspection tool of claim 1 wherein the processor compares the inspection signal from the one or more of the plurality of zones with a reference inspection signal for determining the condition of the joint in the one or more of the plurality of zones.

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6. The inspection tool of claim 5 wherein the processor compares the inspection signal from each of the plurality of zones with the reference inspection signal, and wherein if a predetermined number of the inspection signals deviate from the reference inspection signal by a predetermined difference, the condition of the joint is deemed unsatisfactory.

7. The inspection tool of claim 1 wherein the plurality of zones comprises a plurality of substantially equally sized grid regions.

8. The inspection tool of claim 1 wherein the motion-imparting component scans the arm along the surface and further moves the arm in a direction away from and in a direction toward the surface.

9. The inspection tool of claim 1 wherein the first object comprises a generator stator winding and the second object comprises a copper bar.

10. The inspection tool of claim 1 wherein the motion-imparting component comprises a first and a second slide disposed in perpendicular relation, and wherein longitudinal and transversal directions are defined on the surface, and wherein the first slide translates the arm in the longitudinal direction and the second slide translates the arm in the transversal direction.

11. The inspection tool of claim 1 wherein the joint formed between the first and the second objects is selected from between a brazed joint and a soldered joint.

12. The inspection tool of claim 1 wherein the arm defines an opening therein, and wherein the sensor is rotatably supported within the opening for rotation with two degrees of freedom.

13. The inspection tool of claim 1 further comprising:
a cover plate disposed above the arm; and
a bias member disposed between the cover plate and the arm for exerting a bias force against the arm in the direction of the surface.

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14. The inspection tool of claim 1 further comprising:
a drum;
a motor in axial alignment with the drum for imparting a rotational torque to the drum;
10 a cable attached to the drum wherein rotation of the drum coils the cable onto the drum, and wherein the cable extends away from the drum for attachment to the arm, and wherein drum rotation exerts an upwardly directed force on the arm as the cable is coiled on the drum, such that the arm is moved in a direction away from the surface.

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15. The inspection tool of claim 1 further comprising:
a plurality of position encoders; and
a controller responsive to the plurality of position encoders for determining the position of the sensor on the surface and for controlling the motion-imparting component to place the arm in a desired position.

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16. The inspection tool of claim 1 wherein the processor stores information relative to the inspection signal from the plurality of zones.

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17. The inspection tool of claim 1 wherein the inspection signal comprises an ultrasonic signal.

18. The inspection tool of claim 1 further comprising a transducer supported by the arm for transmitting an incident signal toward the joint, and wherein the inspection signal comprises a reflection of the incident signal from the joint.

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19. An ultrasonic inspection tool for determining the condition of a joint formed between a first and a second object, the ultrasonic inspection tool comprising:

a securing component for removably attaching the tool proximate the joint;

an arm disposed proximate a surface of the first object, wherein the surface
5 overlies the joint;

a motion-imparting component for scanning the arm along the surface;

an ultrasonic transducer/sensor supported by the arm for transmitting an ultrasonic signal toward the joint and for sensing an ultrasonic echo, wherein the joint is subdivided into a plurality of zones, and wherein the signal is transmitted within and the
10 echo is received from one or more of the plurality of zones; and

15 a processor responsive to the echo from the plurality of zones for determining the condition of the joint.

20. An inspection tool for a generator stator winding, wherein the winding comprises a top and a bottom coil interconnected by a copper bar forming a first joint between the top winding and the copper bar and a second joint between the bottom winding and the copper bar, the ultrasonic inspection tool comprising:

25 a securing component for removably attaching the tool to the top or the bottom winding;

an arm disposed proximate a surface of the copper bar, wherein the surface comprises a region of the copper bar substantially bounded by the underlying first or the second joint;

a motion-imparting component for scanning the arm along the surface;

25 an sensor supported by the arm, wherein an inspection signal is generated by the sensor for a plurality of joint zones; and

a processor responsive to the inspection signal for the plurality of joint zones for determining the condition of the first or the second joint.

21. A method for inspecting a joint formed between two joined objects to determine the joint condition, wherein the joint defines an overlap region between the two objects, the method comprising:

transmitting a signal in the direction of the overlap region;

5 sensing the return signal;

wherein the step of transmitting and the step of sensing are executed at a plurality of zones of the overlap region; and

processing the return signals from the plurality of zones to determine the joint condition.

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22. The method of claim 21 wherein a longitudinal and a transversal direction are defined in the overlap region, and wherein the step of moving the arm further comprises moving the arm along the longitudinal and transversal directions.

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23. The method of claim 21 wherein the step of processing comprises:

comparing the return signal from one of the plurality of zones with a reference signal; and

determining the condition of the joint at the one of the plurality of zones in response to the step of comparing.

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24. The method of claim 21 further comprising moving the arm away from the overlap region following the step of sensing the return signal.

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25. A method for determining the condition of a first and a second joint, wherein the first joint is formed between a first surface of a copper bar and a top generator stator coil, and wherein the second joint is formed between the first surface of the copper bar and a bottom generator stator coil, wherein the first joint is spaced apart from the second joint, the method comprising:

removably attaching a transducer/sensor to either one of the top generator stator coil and the copper bar;

transmitting a signal from the transducer/sensor to the first joint;

sensing the return signal from the first joint;

wherein the steps of transmitting to the first joint and sensing the return signal from the first joint are executed at a plurality of first joint zones;

removably attaching the transducer/sensor to one of the bottom generator stator coil and the copper bar;

transmitting a signal to the second joint;

sensing the return signal from the second joint;

wherein the step of transmitting the signal to the second joint and the step of sensing the return signal from the second joint are executed for a plurality of second joint zones; and

processing the return signals from the plurality of first joint zones and the plurality of second joint zones to determine the condition of the first and the second joints.